



# California Hydrogen Highway Blueprint

## Implementation Topic Team

### Sub-team RA/M.1 - Insurance

*Implementation Topic Team Public Hearing*

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*CalEPA, Sacramento, CA*



$$\left[ \frac{p^2}{2\mu} + V(r) \right] \psi(r) = E \psi(r)$$

**California Hydrogen Highways**

[www.hydrogenhighway.ca.gov](http://www.hydrogenhighway.ca.gov)

# Insurance Factors

- Risk Management – Acceptable Risk?
- Risk: Calculated/Assessed/ Quantified or Perceived
  - Probability of Loss
  - Consequences
    - Injuries/Deaths
    - Property Loss
    - Business Interruption
  - Risk Mitigation Measures
- Exposure and Data Confidence



$$\left[ \frac{P^2}{2\mu} + V(r) \right] \psi(r) = E \psi(r)$$

# Insurance Factors

- Design
- Installation
- Safe Procedures, Inspection, Maintenance
- Emergency Response
- Emergency Shut Down
- Worst Case Scenarios



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# Design

- Philosophy, Engineering Implementation
- Applicable Codes & Standards
  - NFPA 52, 2005
  - DOSH Title 8
  - SAE
  - ASME
  - No Current Regs for:
    - Refueling Stations
    - Hydrogen Vehicles
    - CHPs Title 13 for on-road vehicles
  - Encourage Permitting Process



$$\left[ \frac{p^2}{2\mu} + V(r) \right] \psi(r) = E \psi(r)$$

# Installation

- Experience
- Oversight (Permitting, Plan Check, Etc.)
- Commissioning
- Documentation
- AHJ Involvement



$$\left[ \frac{p^2}{2\mu} + V(r) \right] \psi(r) = E \psi(r)$$



# Safe Procedures, Inspection, Maintenance

- Process Safety Analysis
- Training
  - Initial
  - Refresher
  - New Employees
- Inspection
- Maintenance



$$\left[ \frac{p^2}{2\mu} + V(r) \right] \psi(r) = E \psi(r)$$

# Emergency Response

- Fire Department
  - Training
  - Understanding of Hazards
  - Equipment
- ESD
- Users
- CNG Experience?



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# Emergency Shut Down

- Most Effective Response
  - Shut in supply of fuel
  - Annunciate to Central Location
- Gas or Flame Detection
  - Calibration
  - Maintenance
- Local and Remote ESD Buttons
  - Training



$$\left[ \frac{p^2}{2\mu} + V(r) \right] \psi(r) = E \psi(r)$$

# Worst Case Scenarios

- Process Safety Analysis
  - HAZOPs
  - FMEA
  - What-if Checklist
- Consequence Modeling
  - Radiant Heat
  - Vapor travel
  - Overpressure
- Exposures



$$\left[ \frac{P^2}{2\mu} + V(r) \right] \psi(r) = E \psi(r)$$

# Expectations

- Short-term: Self Insurance – Must Be Based on Sound Risk Management
- H2 Codes, Standards & Regulations create solid engineering foundation
- Permitting
- AHJs Must be Involved
- As experience grows, Insurers will Enter the Market
- Recommendation: State work to educate the first responder community, and advocate for effective training at the CCs and other places.
- Look at state level policy options to ease financial burden during a transition.



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